Sempervirens
Winter 2023-2024 The Quarterly of the Virginia Native Plant Society

Annual Meeting: A time for botanically minded meetups

There is no question that our Coastal Plain VNPS Annual Meeting was a fabulous time to meet botanically-minded old friends as well as botanically-minded new friends. From the Friday night dinner and program to the Saturday program and field trips Saturday afternoon and Sunday, it just doesn't get much better.

We were certainly wowed with the Friday night program by Virginia Division of Natural Heritage's senior (by experience, not age) botanist Johnny Townsend about his evolution as a botanist – great stories, great pictures. And again, we all were wowed on Saturday with another phenomenally interesting program by Virginia Institute of Marine Science biologist Karen Duhring, a legend of science and education on Virginia's Living Shorelines.

Participants on the Grafton Ponds field trip at the VNPS Annual Meeting.

On Saturday afternoon and Sunday morning, numerous members signed up for and ventured to one of the many coastal plain field trips. And what a great time – here's a brief summary. But I (and all attendees) must thank our trip leaders for coming forward as volunteers to lead a gaggle of native plant enthusiasts into the field. All are VNPS members and most live in the region and know their plants and landscapes well. Each one did a magnificent job and we all learned from each other. Thank you trip leaders! Also, a big thank you to the following wonderful folks who assisted the leaders as co-leaders/monitors including Steve Mathews (Dragon Run), Pat Murphy (Williamsburg) and Susan Walton (Beaverdam Park).

Sally Anderson and field trip co-leader Maeve Coker "praying" to tiny flowers at Dragon Run.

SATURDAY - The morning's weather was overcast, windy and rainy, scary for all the trip leaders but the afternoon shined on us in more than one way, luckily no rain but some sun!

VIMS Marine Scientist Karen Duhring led a field trip following her talk and lunch to the VIMS Living Shoreline & Natural Marsh "classroom" on the VIMS campus in Gloucester, a premier teaching and research natural shoreline habitat. Living shorelines, in contrast to rip-rap, provide ecosystem services while helping to reduce erosion, improve marine habitat and water quality, and filter stormwater runoff. Their marsh and shoreline represent nature at its best as was Karen's walk. DCR Natural Heritage Ecologist Gary Fleming (retired) led a very

(See Coastal Plain, page 2)

Coastal Plain field trips provided much adventure

(Continued from page 1)

special walk at Grafton Ponds Natural Area Preserve in Newport News. This unique site, a must visit for botanists, represents Virginia's best remaining example of a coastal plain pond complex. The many ponds here were formed by dissolution of the underlying calcareous marine deposits of the Yorktown Formation. This wetland complex supports a wide variety of rare Virginia plants and animals. Gary's walk was amazing and could not have been better.

Johnny Townsend, Virginia DCR Natural Heritage Senior Botanist, and Kevin Howe, VNPS Vice-President, retired ecologist and Board member of Friends of Dragon Run, led a walk at Dragon Run near Saluda. The walk along the Bald Cypress-Tupelo Swamp Forest of Dragon Run is virtually the same as was seen when John Smith explored the area around 1607. And Dragon Run is arguably the most pristine water body in Virginia with 25% of the watershed conservation-protected in some manner. Johnny's comprehensive knowledge of native flora was enlightening. We all learned.

Retired William & Mary botanist Donna Ware treated members to a walk in the Williamsburg Botanical Garden, located in Williamsburg Freedom Park. This two-acre site exhibits over 20 distinct native plant habitats with over 150 species of woody plants and far more herbaceous natives. The garden, over 20 years old, is managed totally by volunteers from VNPS, Master Naturalists, Master Gardeners, and others. This gem of a native plant garden hidden in Williamsburg is free and open to the public.

Retired botanist Meegan Wallace led members on a walk at Newport News Park. This 7,700-acre municipal park, one of the largest east of the Mississippi, offers a variety of trails through coastal forest, swamps, and more. Despite another event that day that created parking issues to the trail that Meegan had previewed, VNPS members and Meegan pulled off a delightful walk. Meegan, a long-time volunteer at the park, was able to choose another trail and led a great walk while shining in her plant knowledge.

SUNDAY – It was a beautiful fall day for a walk in Virginia's Coastal Plain habitats.

A visit to the Tides Inn in Irvington is a surprise for native plant people. The inn is located on Carters Creek in sight of the Rappahannock River. Botanist and Horticulturist for the Tides, Matt Little, led a tour of the Tides recent living shoreline restoration project. This amazing restoration is one of the largest public shoreline restorations on the East Coast with 18,000 square feet of new Living Shoreline planted with over 20,000 native shoreline and upland plants, preservation of existing old growth trees and dozens of new native trees - not to mention 1,300 linear feet of boardwalk over restored wetlands. The Tides Inn recently received the Governor's Environmental Excellence Award for this shoreline.

VNPS member and Virginia Master Naturalist Edie Bradbury led a walk in Beaverdam Park, a little gem in Gloucester that includes 635-acre Beaverdam Lake and an abundance of native flora and fauna. Field trip members were delighted by Edie's encyclopedic knowledge of native plants occurring in the park's fine examples of coastal plain habitats. Another walk, mimicking Saturday, was held at Dragon Run. Alas, Johnny Townsend could not co-lead on Sunday, but Saturday's co-leader Kevin Howe was joined by Maeve Coker, a botanist (USFWS) and also a board member of Friends of Dragon Run. Any walk though this unique ecosystem is amazing and wonderful. With these two leaders, the trip went longer than planned but was enjoyed by all. This Bald Cypress-Tupelo forest is nearly the northern-most extent of this community in eastern North America, making it a gem to botanize.

--Kevin Howe, VNPS First Vice-President; all photos with permission from Kevin Howe, Brigitte Hartke, and Adrienne Frank.

Verbesina virginica (White Wingstem) flowers at Grafton Ponds.

What Annual Meeting participants had to say...

First time participant Ivy Makia of Harrisonburg

"I had a good time at the meeting. It was great to rub shoulders with other like-minded plant lovers and environmentalists. There were so many great field trip opportunities, I wish I had had the opportunity to visit all of the sites. In that regard, it exceeded my expectation because of the genuine excitement that I had for the locations that we could visit. Also, the main presentation focused on a specific topic that I hadn't learned about so it was very enlightening, and I left that meeting with newfound knowledge that I could clearly communicate to others."

"Looking back over this year, one of the best experiences I've had was my first attendance at the Virginia Native Plant Society's annual meeting at the Virginia Institute of Marine Science in Gloucester. I knew that a lot of planning and organization had gone on in the weeks and months before the event, ensuring an enjoyable, hassle-free experience for attendees. It was delightful to reconnect with friends from other chapters and make some new friends. We were treated to talks given by Marine Scientist Karen Duhring and Senior Botanist John Townsend. The highlights of the weekend were the naturalist-led walks exploring the natural wetland preserves in that area of Virginia. I look forward to next year's meeting with great anticipation."

First time attendee, Brigitte Bégué Hartke of Centreville

More scenes from the Annual Meeting

Field trip leader Matt Little leads a group exploring the land around the Tides Inn.

Grafton Ponds trip leader Gary Fleming (center in blue jacket) leads his group of intrepid explorers.

Grafton Ponds tree huggers.

Camaraderie, learning prominent at Annual Meeting

From the President
Nancy Vehrs

Our annual meeting in October was a smaller than usual affair, but those who participated enjoyed the camaraderie and learning opportunities. On Friday, October 6, we met at the Edgehill Community Center in Yorktown where we held an opening reception followed by dinner and a presentation by botanist Johnny Townsend. Early-arriving members pitched in to set up the big room. With a lower attendance than expected, caterers Lawrence Hurt and Monique Barnes delivered and set up the food but did not stay to serve. The main entrée was a delicious roasted chicken, but this omnivore found the vegan "meatloaf" option surprisingly tasty. Following dinner, Johnny Townsend, senior botanist with the Virginia Natural Heritage Program, presented to the group, recounting his professional journey with the aid of many photographs and maps. As a boy growing up in Charleston, S.C., he enjoyed exploring that area's coastal wetlands and identifying birds. It was at Clemson University where he found a mentor and discovered a love for plants. Johnny was one of the co-authors of the *Flora of Virginia*, is the president of the Virginia Botanical Associates (the organization behind the Digital Atlas), and he serves on the VNPS board of directors.

On Saturday, October 6, the group gathered at Waterman's Hall, the impressive visitor center for the Virginia Institute of Marine Science (VIMS) in Gloucester Point. The lobby held several aquaria, audiovisual displays, and models to aide in interpreting Chesapeake Bay ecosystems. Participants checked in with VNPS office manager Karen York and registered for the weekend's field trips under the guidance of First Vice President Kevin Howe. The process proceeded smoothly, and everyone was able to sign up for their first-choice trips.

Following an impressive continental breakfast spread that some folks took outside to enjoy, it was time to gather in the auditorium. Karen Duhring, Marine Science Supervisor in the Center for Coastal Resources Management at VIMS, was the morning's speaker. She explained how VIMS is the graduate school in marine science for the College of William & Mary. Chartered in 1940, VIMS has a "three-part mission to conduct research in coastal ocean and estuarine science, educate students and citizens, and provide advisory service to policy makers, industry, and the public." Karen's special interest is living (vegetated) shorelines, and she provided examples of their use and success in combating flooding and erosion and creating habitat.

The formal business meeting followed with the election of select officers and board members and presentation of the annual budget and president's report. I announced that our annual fundraiser would benefit the Natural Area Preserve Fund for the Virginia Department of Conservation and Recreation's Division of Natural Heritage. We expressed appreciation for the years of service of outgoing secretary Betty Truax and fundraiser chair Peggy Troyer, respectively. Outgoing Treasurer Kathleen Stasulis was unable to attend.

Participants picked up their boxed lunches and proceeded to their afternoon field trips, which Kevin Howe describes elsewhere in this issue. In the evening some members joined Harry and me in our hotel room for a happy hour with food and drink. Saturday night afforded the opportunity to explore local restaurants for dinner. On Sunday morning, some members gathered at the designated hotel for breakfast before departing for their field trips. The event was intimate and friendly.

I thank Sally Anderson, Kevin Howe, Mark Murphy, Karen York, all the field trip leaders and speakers, and countless others who stepped up to make the annual meeting happen. ❖

Sempervirens (ISSN 1085-9632) is the quarterly newsletter of the Virginia Native Plant Society, Blandy Experimental Farm, 400 Blandy Farm Lane, Unit 2, Boyce, Va. 22620, 540-837-1600, info@vnps.org. Nancy Vehrs, President; Nancy Sorrells, Editor; Karen York, Office Manager. Original material in *Sempervirens* may be reprinted if credit is given to the Virginia Native Plant Society, to *Sempervirens*, and to the author of the material, if named. Readers are invited to send letters, news items, and queries for consideration. E-mail items to Nancy Sorrells at lotswife@comcast.net.

Next submission deadline:
January 30, 2024

Virginia's NAPs worthy of our support

Buffalo Mountain Natural Area Preserve (Gary Fleming photo)

Building on the success of our 2021 fundraiser for Virginia's Natural Area Preserve System, the VNPS board chose to dedicate our 2023 fundraiser to increasing those funds. Stewardship of natural resources is a responsibility of all. It is, we believe, what motivates you to continue being involved in and support the programs and initiatives of the Virginia Native Plant Society.

At this time of year, we know that you are considering your philanthropic contributions to deserving causes and organizations. We hope you include Virginia's Natural Area Preserve System in your considerations of support.

Our members have demonstrated many times their dedication to the mission of VNPS to protect and preserve the native plants of Virginia and their habitats "in order to sustain for generations to come the integrity of the Commonwealth's rich natural heritage of ecosystems and biodiversity for purposes of enjoyment, enlightenment, sustainable use, and our own very survival." We are deeply grateful to you for this unwavering commitment.

Thanks to many of you, VNPS has provided critical financial support for Virginia's Natural Area Preserve System through two previous fundraising efforts. This year we ask for your generous contribution to our $50,000 goal to ensure that biodiversity is protected on the lands managed by the Natural Heritage Program as they are among the only lands in the Commonwealth officially dedicated to biodiversity protection.

The Code of Virginia dictates that Natural Area Preserves (NAP) must support one or more natural heritage resources such as the habitat of rare plant and animal species, or significant natural communities. To-date, the relatively small NAP system includes the largest collection of protected rare species and natural communities in the state.

With no dedicated state funding, grants and donations from people like you are needed to facilitate NAP transactions. Since 2020, the Virginia Department of Conservation and Recreation has established 3 new NAPs and added 28 individual land parcels to the statewide system mostly through purchases from landowners at market value, and VNPS has helped with the expansion of two, and the creation of the third. Each tract acquired or expanded with the help of VNPS funds has been permanently conserved and dedicated to the Virginia Natural Area Preserve system and managed to enhance and expand rare species populations and habitats, creating a more ecologically-resilient Natural Area Preserve system. Among the species and habitats for which VNPS support would be helpful include Gray's Lily, Piedmont Barbara's-Buttons, Virginia Sneezeweed, Large Pussy Willow, and Piedmont Fameflower, as well as Northern White Cedar Forest, Ridge and Valley Calcareous Spring Marsh, and Valley Prairie Fen communities.

Your generous contribution to this fund will help support primarily the required pre-acquisition expenses, as well as supplement land purchase costs when needed. Every dollar VNPS contributes toward the Natural Area Preservation Fund will go toward land acquisitions and help further grow the NAP system.

We know that at this time of year your generosity is offered to organizations and charitable causes dear to your heart. That's why your generous gift to Virginia's Natural Area Preserves is so much more appreciated by VNPS; it demonstrates your firm dedication to the foundational principles of our community.

Please join us as we offer our support to wild plants and wild spaces that we all value so much. Go online to make your valuable gift at https://vnps.org/napfund/. If you have already contributed to this fund, we sincerely thank you for your thoughtful generosity.

--Emilia Godwin, VNPS Fundraising Chair, and Nancy Vehrs, VNPS President

2024 WOY
Hybridization & Polyploidy in the Turtleheads

Article and graphic by W. John Hayden, Botany Chair

The VNPS Wildflower of the Year for 2024 is *Chelone glabra*, White Turtlehead. Altogether, there are four species of Turtlehead native to eastern North America, and three of these are known to occur in Virginia. Considered together, the species of Turtlehead illustrate an interesting pattern of morphological characteristics that, when coupled with information about chromosome counts, yield significant insight into the history and relationships of these charming plants. In fact, our beloved Turtleheads provide an instructive example of the role that hybridization and polyploidy has played in the diversification of plant life on this good, green, Earth.

The genus *Chelone* is relatively easy to recognize. Turtlehead flowers have horizontally oriented tubular corollas with a prominent ridge on the upper (adaxial) surface and a two-lipped (bilabiate) opening; further, the flowers are densely packed into a relatively short spike-like inflorescence. Although recognizing the genus is relatively easy, distinguishing the species is more challenging because many characters overlap or intergrade between species. Often, it is unique combinations of characteristics that provide the best means for distinguishing one species from another.

Another factor that can make species identification challenging is that *C. glabra*, White Turtlehead, the most common and widespread of the four species, is also the most variable. *Chelone obliqua*, Red Turtlehead, presents another facet of the problem. According to Nelson and Elisens (1999), there is no single morphological character possessed by *C. obliqua* that is unique to that species; every characteristic of *C. obliqua* is shared with either *C. glabra* or *C. lyonii*, which is known as Pink Turtlehead. Nevertheless, it is the unique combination of multiple characters that defines *C. obliqua*. How can it be that Red Turtleheads represent a combination of characteristics found in two other species? Almost certainly, the explanation is that Red Turtleheads originated by hybridization between White and Pink Turtleheads. However, as we shall see, in addition to hybridization, changes in chromosome numbers were a major part of the story, too.

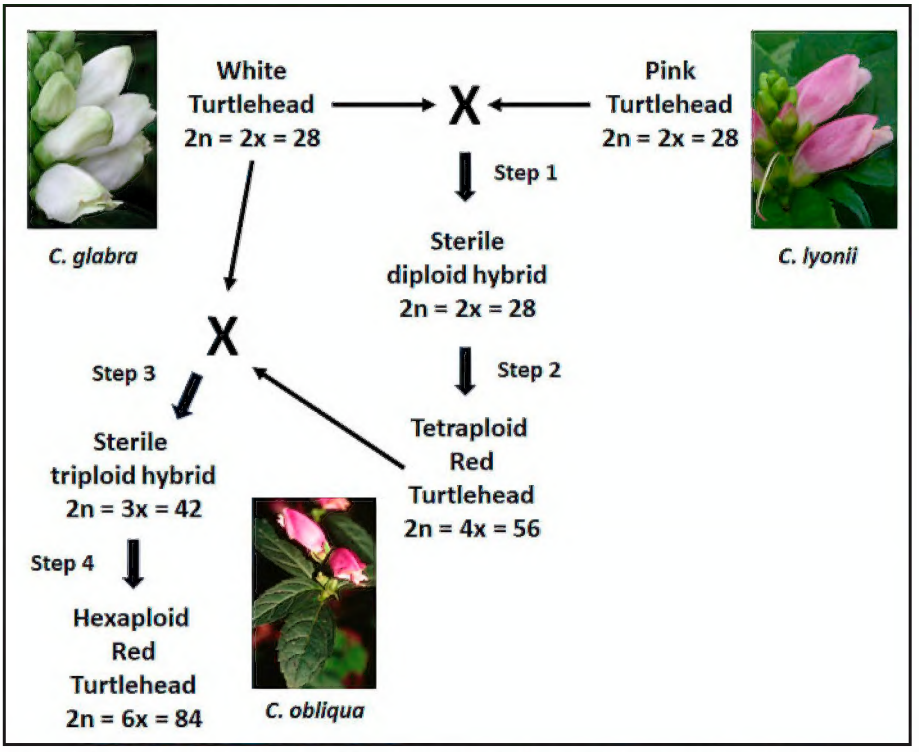

Figure 1. Allopolyploid origin of Red Turtlehead. Hybridization between White and Pink Turtleheads followed by chromosome doubling can explain the origin of tetraploid Red Turtleheads. Backcrosses between tetraploid Red Turtleheads and White Turtleheads, also followed by chromosome doubling can explain the origin of hexaploid Red Turtleheads. See text for further explanation. Diagram by W. John Hayden; photo of Red Turtlehead courtesy Virginia Division of Natural Heritage.

In the study of plant biodiversity, it has long been known that the number of chromosomes per cell has profound biological significance. By the late 1800s, a foundational concept about chromosome numbers and the process of sexual reproduction was well understood: for the most part, cells of adult plants and animals (including humans) have twice as many chromosomes as the reproductive cells, i.e., the sperm and eggs made by adults. The terms diploid and haploid are useful in this regard. Gametes (sperm and eggs) contain only one copy of each kind of chromosome, a condition described as haploid; the assemblage of chromosomes present in a gamete can be envisioned as one chromosome "set" for that species. Fusion of gametes combines two haploid sets of chromosomes into a single cell which, if all goes well, will grow to become myriad cells

of another adult plant or animal. Thus, cells of adults contain two copies of each kind of chromosome, a condition described as diploid. Further, also by the late 1800s, it was understood that a special form of cell division called meiosis reduces the chromosome number of certain diploid cells in adult organisms to the haploid condition found in gametes or spores. (In plants, haploid spores eventually produce sperm or egg cells.) And there is one critical aspect of meiosis that must be mentioned here: for meiosis to proceed successfully, early in the process, it is essential that similar chromosomes pair up (synapse) so that only one of each kind of chromosome goes to the haploid cells that result from meiosis.

By the second decade of the 20th century, botanists discovered polyploidy, a subtly different but highly significant aspect of how chromosome numbers can vary among plants. To understand polyploidy, it helps to set aside, temporarily, the diploid/haploid distinctions involved in the reproductive process and focus, instead, on comparisons of chromosome counts between adults of different species. Routinely, root tip cells provide a convenient source from which to count and compare chromosomes of related plants. Chromosome counts from the species of *Chelone* provide a textbook example of how hybridization and polyploidy can lead to diversification of species.

Over the years, multiple investigators have counted Turtlehead chromosomes; Nelson et al. (1998) and Nelson and Elisens (1999) provide useful summaries: Cuthbert's Turtlehead (*C. cuthbertii*), White Turtlehead (*C. glabra*), and Pink Turtlehead (*C. lyonii*), all yield counts of 28 chromosomes per cell; though typically counted from root tip cells, these counts are understood to be the same throughout cells of the adult, non-reproductive phase, of these plants. In contrast, counts for some populations of Red Turtlehead yield 56 chromosomes per cell, whereas other populations yield counts of 84 chromosomes per cell. Note that 56 chromosomes are twice as many as 28 chromosomes, whereas 84 is three times as many. In this case, 14, the haploid count for species with 28 chromosomes per adult cell, constitutes one "set" of chromosomes; said another way, for all species of *Chelone,* x (the base number) = 14. The 56-chromosome populations of Red Turtlehead have four such sets and are characterized as tetraploid (4x). Similarly, the 84-chromosome populations of Red Turtlehead have six sets of chromosomes and are characterized as hexaploid (6x). Origin of these polyploids can only be explained as a multiple step process.

Step 1. As noted above, at some time in the past, cross pollination between White and Pink Turtleheads probably resulted in hybrid offspring and those hybrid plants would have resembled Red Turtlehead, which has a certain combination of the characters found in the parents of the cross. Unlike known modern populations of Red Turtlehead, however, these initial hybrids would have had a chromosome count of 28, the result of 14 chromosomes inherited from White Turtlehead and another 14 from Pink Turtlehead **(see Figure 1)**. Sometimes, interspecific hybrids are fertile, but that is not always the case. Because nobody has reported a chromosome count of 28 for any Red Turtleheads, we can infer that our hypothetical diploid hybrid plants may have been unable to make seeds. Infertility in this hypothetical hybrid Turtlehead can be explained if the genes and chromosomes from White and Pink Turtleheads are sufficiently compatible to support basic processes of plant growth, photosynthesis, root growth, etc., but different enough that the critical process of chromosome pairing during meiosis fails and no gametes can form. Turtleheads are perennial plants. Consequently, our hypothetical sterile diploid hybrids could have lived for years and years without ever producing any offspring. And this sort of hybridization event would have no effect on the gene pools of the parent species because the sterile hybrids could not backcross with either parent. Sterile hybrids have no impact on the gene pools of their parents.

Step 2. The sterile diploid hybrid Turtlehead spontaneously underwent a process of chromosome doubling. Yes, this might seem like magic, but the process of chromosome number doubling (polyploidy) is a scientifically documented and well understood phenomenon. Here is one way that chromosome numbers can double: prior to ordinary cell division (mitosis), chromosomes become double structures so that, when the halves split apart, each daughter cell can receive one full set of chromosomes. If the process misfires, however, the double complement of chromosomes can remain in one cell which, by this error, spontaneously has become tetraploid. If that tetraploid cell thrives, eventually a large portion of the plant can be occupied by tetraploid cells. And by becoming tetraploid, that portion of the hybrid suddenly becomes fertile again. Why? Because now, during the critical process of meiosis in our hypothetical hybrid tetraploid Turtlehead, there would be two of every chromosome that came from White Turtlehead and two of every chromosome that came from Pink Turtlehead. Because there are two of each kind, chromosome pairing in meiosis is unimpeded and gamete formation proceeds normally.

(See Turtleheads, page 8)

White Turtleheads (*Chelone glabra*) (John Hayden photo)

Turtleheads

(Continued from page 7)

Step two explains the origin of fertile, tetraploid, Red Turtleheads. The scenario outlined here is called allopolyploidy, chromosome doubling following hybridization; chromosome doubling in a non-hybrid plant is distinguished as autopolyploidy.

Step 3 involves another hybridization event, technically a backcross, this time between tetraploid Red Turtlehead and diploid White Turtlehead—patterns of shared characters suggest the diploid parent of this backcross was White Turtlehead, not Pink. In the process of this backcross, tetraploid Red Turtlehead would make gametes with two sets of chromosomes whereas diploid White Turtlehead would make gametes with just one set of chromosomes; their offspring would thus be triploid. And these triploid hybrids would be sterile, because there is no way that three sets of chromosomes can form proper two-by-two pairs during meiosis.

Step 4. Again, Turtleheads are perennial plants, and if these sterile triploids lived long enough, another magic-like doubling of chromosomes could occur, converting a triploid cell to hexaploid, i.e., with six sets of chromosomes, four sets having originated from White Turtlehead and two from Pink Turtlehead. Again, if that hexaploid cell thrives, and eventually makes a group of cells that form flowers, those flowers would be fertile. Hexaploid Red Turtleheads probably formed this way, a second instance of allopolyploidy.

Steps 1-4 could well explain the origin of Red Turtleheads from their White and Pink parents. It makes sense that tetraploid and hexaploid populations of Red Turtlehead are similar morphologically, because they possess a mix of genes and chromosomes from the same two parent species. Theoretically, however, tetraploid Red Turtleheads and hexaploid Red Turtleheads are reproductively isolated from each other; potential hybrids would be sterile pentaploids (five sets of chromosomes)—no chance of successful meiotic pairing of chromosomes when there is an odd number of chromosome sets. Given that there is no chance of gene flow between tetraploid and hexaploid Red Turtleheads, these two could be interpreted to be separate species—but it would take microscopic work counting their chromosomes to tell them apart!

Step 5 (not illustrated in Figure 1). The four-step story about the origin of Red Turtleheads from White and Pink Turtleheads is not quite complete. There is good evidence that the existing tetraploid Red Turtleheads were probably not involved in the origin of the existing hexaploid Red Turtleheads. We know this because of detailed studies of Turtlehead genetics that sampled multiple populations of Red, White, and Pink Turtleheads. Said simply, tetraploid Red Turtleheads are found in the southern Blue Ridge and their gene variants match the gene variants found in White and Pink Turtleheads of the same region. Similarly, gene variants of Red Turtleheads to the west of the Blue Ridge match gene variants of White Turtleheads from that region; and the same is true for Red and White Turtleheads found east of the Blue Ridge. Evidently, allopolyploid origin of Red Turtleheads happened, independently, at least three different times; there must have been a two-step process for the origin of tetraploids in the Southern Blue Ridge, and two occurrences of the four-step process for the origin of hexaploids, one occurrence to the west and one to the east of the Blue Ridge. Multiple allopolyploid origins of Red Turtleheads probably also explains the wide range of corolla pigmentation, from pale pink to shades of purple and red-purple, found in this species; a particularly reddish example was selected purposefully for the photograph contained in **Figure 1**.

Lest the story of polyploidy among these Turtleheads seems preposterously complicated, let me assure you that the science is solid, that the general process is well-understood, and that numerous parallel cases are known. Commercial cotton and tobacco crops are allotetraploids. And modern wheat, the staff of life, is known to have developed from ancient diploid einkorn wheat hybrids that gave rise to tetraploid emmer wheats, and the tetraploid emmer after another hybridization event became hexaploid bread wheat; hybridization and doubling of chromosomes were involved in each step.

Thus, the simple act of counting Turtlehead chromosomes, the microscopic strands of genetic material found in cells, has provided far-reaching insight into the biology of these seemingly simple wildflowers.❖

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Rally for the plants by supporting America's Wildlife Act

In early November, several conservation groups held a "Plant Conservationists' Virtual Rally" including the SE Plant Conservation Alliance, National Wildlife Federation, NatureServe, and Atlanta Botanical Garden. Hundreds of folks attended from all over the country listening to speakers from each group outlining the urgent need to support a piece of legislation pending in the U.S. Senate, the Recovering America's Wildlife Act (RAWA). This proposed piece of legislation is, without doubt, the most significant such act since the Pittman-Roberson Act 86 years ago.

As most hunters, anglers, and conservationists know, the Federal Aid in Wildlife Restoration Act of 1937 (commonly known as the Pittman-Robertson Act) provided an 11% excise tax (later changed to 10%) on firearms, ammunition and archery equipment with those funds earmarked for support of state projects of wildlife and their habitats. This tax was already in place but instead of the money just going into the Federal coffers, it now went toward conservation. While amended in various ways since its inception, there is no doubt the act has provided funds to states that would otherwise do little in regard to wildlife and habitat conservation-protection. Incidentally, the Robertson whose name is immortalized in the name of the act, was actually Absalom Willis Robertson, a Democrat who served in the U.S. House of Representatives and Senate representing Virginia. Democrat Key Pittman was a New Mexico Senator.

While the Pittman-Robertson Act has helped the conservation of our native flora and fauna tremendously, we all know so much more needs to be done. Our biodiversity loss is ever increasing with about one-third of our flora and fauna at some risk of extinction.

Although this bill was first proposed in 2016, it never moved forward until 2021 when Rep. Debbie Dingell of Michigan introduced the Recovering America's Wildlife Act (RAWA). This bill was actually an amendment to the Pittman-Robertson Act and would provide $1.3 billion per year in "funding for the conservation or restoration of wildlife and plant species of greatest conservation need, including endangered or threatened species, and establishes related requirements." It was House Bill H.R. 2773 and passed the House with bipartisan support and entered the Senate with bipartisan support from Committee but never passed the full Senate and therefore expired on January 3, 2023.

In March of 2023, Senators Martin Heinrich (D-NM) and Thom Tillis (R-NC) reintroduced this same RAWA legislation (as S. 1149, RAWA). Although introduced, it has not gone through Committee, the first step in the legislative process. It has garnered 29 cosponsors of both parties but none are from Virginia!

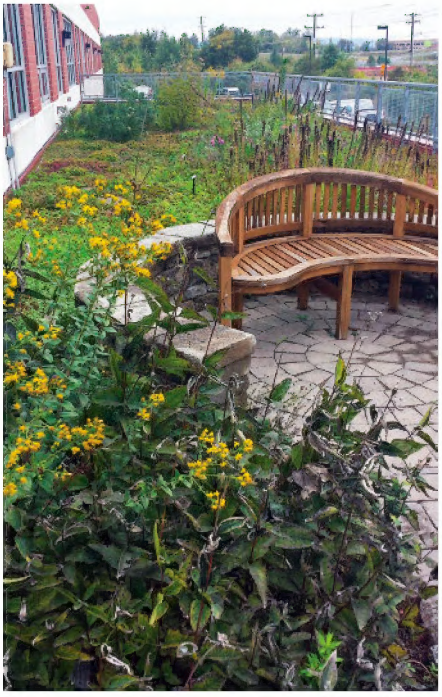
So, my fellow VNPS friends, it is time for all of us to contact both of our Virginia senators urging them to support fully and sponsor this bill. If you are in another state, contact your own senators. Writing to representatives will come later, I hope. Phoning our senators is easy and helpful, but the more personal touch of a letter or email is really warranted. As a retired ecologist, I am saddened every day about the declining flora and fauna and their associated habitats that I have seen in my brief journey on this planet.

Emailing about this has been made easy thanks to the National Wildlife Federation (NWF). They have put together verbiage that you can copy and paste into your email or letter and send off yourself or allow NWF to send it for you.

Find it at https://support.nwfactionfund.org/page/27217/action/1 or create your own email mentioning the RAWA legislation – S. 1149 and the risk of extinction to over one-third of our flora and fauna. Please think of our future generations and take the time to contact Senator Tim Kaine (easy at https://www.kaine.senate.gov/contact/share-your-opinion) and Senator Mark Warner (also easy at https://www.warner.senate.gov/public/index.cfm?p=ContactPage). Future generations will thank you.

--Kevin Howe, VNPS First Vice-President

Green roof good for the environment, good for the soul



WSSI Green Roof in October (Nancy Vehrs photos)

What a pleasure it is to visit a green roof garden every month when the Prince William Soil and Water Conservation District Board holds its public board meetings in the training room at Wetland Studies and Solutions (WSSI) in Gainesville. Designed as part of WSSI's Leadership in Energy and Environmental Design (LEED) Gold building in 2006, this garden has stood the test of time. Accessible from the second-floor training room, this 3,626 square-foot primarily native plant garden has a walkway and inviting seating areas.

Roof gardens are challenging because the conditions are hotter, drier, and windier than on the ground. Because of this, many green roofs use mostly nonnative sedum species that can withstand such conditions. The WSSI green roof, conversely, employs many natives as well. It even has two wetland pods planted with Blue Flag Iris, Soft Rush, Green Bulrush, Woolgrass, and Grey Goldenrod. According to the WSSI website, these wetland pods were created from a loop of six-inch flexible HDPE pipe, a pond liner, and thick, impermeable soil. The pods are kept wet by individual moisture sensors and drip irrigation systems. During the first growing season in 2006, the Bulrush grew nearly six feet tall. The green roof is supported almost entirely by direct rainfall.

According to Amy Connelly, Northern Virginia director for WSSI, "We consider the green roof one of the many gems of our office. Staff often use it to hold meetings, have a quiet place to talk, review reports, and enjoy lunch. In addition, the green roof and its diversity of pollinator-friendly plantings, also recently helped us receive the 2023 Wildlife Habitat Council Green Infrastructure Project award which recognized our corporate excellence in conservation for the multi-feature habitat benefiting community biodiversity."

The roof garden has two distinct areas. As noted on the website, the extensive areas have just a four-inch soil layer and are planted with nine species of sedum. The intensive native plant areas have a depth of four to nine inches of soil with higher organic matter content and are planted with a variety of native perennials and shrubs. WSSI staff tends to the garden regularly, but remarkably, no invasive plants have been a problem.

My last visit to the garden was in October as reflected in the photographs. Butterflies were enjoying the flowers, but they were too quick for my cellphone camera. For more information on the roof garden or WSSI's LEED gold building, visit https://www.wetlands.com/about/our-leed-gold-building/.

--Nancy Vehrs, VNPS President

WSSI Green Roof in February

A list of many of the other native species in this green roof garden listed alphabetically by scientific name:

Achillea millefolium, Yarrow

Aquilegia canadensis, Wild Columbine

Baptisia australis, Wild Blue Indigo

Ceanothus americanus, New Jersey Tea

Conoclinium coelestinum, Blue Mistflower

Comptonia peregrina, Sweet Fern

Coreopsis verticillata, Threadleaf Tickseed

Eupatorium perfoliatum, Boneset

Eutrochium purpureum, Joe-pye-weed

Heliopsis helianthoides, Oxeye Sunflower

Liatris spicata, Blazing Star

Opuntia humifusa, Eastern Prickly Pear

Penstemon digitalis, Foxglove Beardtongue

Rosa carolina, Carolina Rose

Rudbeckia hirta, Black-eye Susan

Symphyotrichum ericoides, White Aster

Symphyotrichum novi-belgii, New York Aster

Native vs. invasive is an issue the world over

I recently spent a month in South Africa soaking in the natural and human history of this incredible part of the world. Much of our time was spent photographing the wonder of the outdoors, meaning, of course, snapping a lot of pics of lions, elephants, giraffes, zebras, hippos, cheetahs, and more. While we were at Kruger National Park, we actually bought a small guide in which we could check off all the species of animals that we spotted.

For the record, there are 847 species of animals, large and small, at Kruger. But guess what? There are 2,000 species of plants, including 450 species of trees. However, try as I might, I could not find a single plant guide to help me figure out the flora at which I was looking.

Luckily, one day while we were out exploring, we stumbled upon the Skukuza Nursery in the national park. There I found what I had been searching for – the South African counterpart to the Virginia Native Plant Society. The staff and volunteers at the nursery and small gardens have a dual campaign to promote the power of indigenous plants and to expose the evils of invasive plants.

The entrance to the Skukuza Nursery and gardens. (Nancy Sorrells photos)

For decades, the nursery has been growing native plants and selling them at very low prices to the burgeoning game preserves and lodges all over the country in hopes of persuading folks that it is better for the ecosystem and their landscaping budget if they just go native. The array of plants that they have available to help the public do just that is impressive.

More recently they have been trying to advocate for the indigenous alternative to popular exotic (alien) plants. We happened to be in South Africa while the showy Jacaranda trees (*Jacaranda mimosifolia*) were blooming and their brilliant purple blossoms could be spotted everywhere. The streets of the capital city of Pretoria are lined with them.

Unfortunately, the Jacaranda, a native of South America, outcompetes native plant species, while providing nothing of use for the animal species. That is why it is now illegal to plant new Jacaranda trees, but Pandora's Box has been opened. Jacarandas also use an extraordinary amount of water in an arid land. The folks at the nursery are asking people to plant the native Tree Wisteria (*Bolusanthus speciosus*) with its clusters of purple blossoms instead. In fact they are giving away seeds from the Tree Wisteria in order to encourage planting of this similar looking native tree.

Some of the exotic species that

(See South African, page 12)

Native *Euophorbia grandicornis*

Introduced Jacaranda tree

Tree Wisteria seeds for free.

South African native plant issues

(Continued from page 11)

are particularly troubling in the Kruger area are several species of cactus including Sour Prickly Pear (*Opuntia stricta*). Actually, there are no native cacti in South Africa. There are plenty of succulents including a funny looking plant, *Euophorbia,* which has a trunk like a tree and branches that look like a cactus.

Native Cape Honeysuckle (*Tecoma capensis*) sold at the nursery. The sign says: "Grows easily, will make a suitable hedge plant. The flowers come in various colors from orange to yellow. In colder areas the plants may become deciduous. A wonderful addition to a bird lover's garden."

The tree is also called the Milk Tree because of the poisonous white latex that pours down its trunk if pierced.

Other alien troublemakers might sound familiar to us. We have a problem with a Mile-a-minute plant, while they struggle with the Mother-of-millions (*Bryophyllum delagoense*)! Both names indicate the fast and destructive nature of invasive alien plants. Worrisome exotics also include Morning Glory (*Ipomoea purpurea*), Dutchman's Pipe (*Aristolochia littoralis*), Wandering Jew (*Tradescantia zebrina*), Elephant Ear (*Colocasia esculenta*), and Poinsettia (*Euphorbia pulcherrima*).

The campaign to rid the habitat of alien invasive plants in the Kruger area has picked up steam as the folks at the nursery urge people that non-native plants are "Monsters dressed in pretty flowers and luscious leaves, devouring as they grow and spread."

Rows of plants for sale at the nursery. (Nancy Sorrells photos)

One poster that touts the benefits of native plants over the problems of non-natives, proclaims that "The moral of the story: Home-grown is best, plant indigenous."

It just goes to show that native plant people and their principles are the same no matter from where on the globe they hail.

--*Nancy Sorrells,* Sempervirens *editor*

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